The present invention relates to a method for regeneration of a particulate filter for a motor vehicle and to a device for use of such a method.

As is known in itself, the exhaust systems of diesel-engine vehicles are equipped with particulate filters for the purpose of suppressing discharge of soot particles into the environment.

Regeneration operations must be performed periodically in order to prevent fouling of the particulate filter and the poor engine function that can result therefrom.

The regeneration method is based on knowledge of different parameters, especially on knowledge of the differential pressure at the ends of the particulate filter and of the pressure upstream from this filter.

Thus it is necessary to provide both a differential pressure sensor and an upstream pressure sensor.

The use of two sensors is complex and expensive.

The object of the present invention is to eliminate this disadvantage.

This object of the invention is achieved with a method for regeneration of a particulate filter situated on an exhaust line of the engine of a motor vehicle, the method being of the type in which the burden of the said filter is evaluated with a model of the type:

$$\Delta P = f(\text{Qvol, mass of soot}), \text{ with:}$$

$$\Delta P = \text{Pupstream} - \text{Pdownstream}, \text{ and}$$

$$\text{Qvol} = K \times (\text{Qair} + \rho\text{fuel} \times \text{Qcarb}) \times N \times \text{Tupstream} / \text{Pupstream},$$

where:

- Pupstream and Pdownstream are the pressures measured respectively upstream and downstream from the said particulate filter,
- K is a constant,
- Qair denotes the mass flow of air measured by a flowmeter,
- pfuel denotes the density of the diesel fuel,
- Qcarb denotes the volumetric quantity of diesel fuel injected into the said engine,
- N denotes the rpm of the said engine, and
- Tupstream denotes the absolute temperature measured upstream from the said particulate filter,

characterized in that Pdownstream is modeled and in that Pupstream is determined by means of the relationship Pupstream = ΔP + Pdownstream.

By virtue of these characteristics, merely the measurement of the differential pressure ΔP is sufficient to determine when it is necessary to trigger regeneration of the particulate filter, so that it is possible to rely on a single pressure sensor.

The present invention also relates to a device for use of a method according to the foregoing, characterized in that it includes, as the sole pressure sensor, a differential pressure sensor intended to be mounted on the said particulate filter.

The present invention also relates to a motor vehicle, characterized in that it is equipped with a device according to the foregoing.

Other characteristics and advantages of the present invention will become apparent upon reading the description hereinafter and upon examining the single figure of the attached drawing, which schematically illustrates a device for use of the method according to the invention.

This figure illustrates a motor vehicle 1 provided with an engine 3 of diesel type, that is, running on diesel fuel, and with an exhaust line 5 equipped with a particulate filter 7.

The operation of engine 3 and of particulate filter 7 is supervised by a computer 9.

The operation of regeneration of particulate filter 7 comprises raising the temperature of the exhaust gases to bring about combustion of the soot inside the particulate filter using appropriate means for assisting regeneration.

The activation of these means for assisting regeneration is controlled by computer 9 according to a certain number of parameters, and especially the soot burden of the particulate filter.

The method used to manage these regeneration means includes a stage of recognition of the burden of particulate filter 7, based on a model of the type:

$$\Delta P = f(\text{Qvol, mass of soot}), \text{ with:}$$

$$\Delta P = \text{Pupstream} - \text{Pdownstream, and}$$

$$\text{Qvol} = K \times (\text{Qair} + \rho\text{fuel} \times \text{Qcarb}) \times N \times \text{Tupstream} / \text{Pupstream},$$

where:

- Pupstream and Pdownstream are the pressures measured respectively upstream and downstream from the particulate filter,
- K is a constant,
- Qair denotes the mass flow of air measured by the flowmeter,
- ρfuel denotes the density of the diesel fuel,
- Qcarb denotes the volumetric quantity of diesel fuel injected into engine 3,
- N denotes the rpm of engine 3, and

- Tupstream denotes the absolute temperature measured upstream from the particulate filter.

This model therefore assumes as known values both the differential pressure ΔP at the ends of the particulate filter and the absolute pressure Pupstream upstream from this filter.

It is important that the information relating to ΔP be as precise as possible: an appropriate differential pressure sensor 11 is therefore used to measure this differential pressure.

On the other hand, the requirements of precision relating to knowledge of the upstream pressure Pupstream are less strict: it is therefore possible to dispense with a measurement of this pressure and to replace it by a calculation model.

It has been found that, by modeling the downstream pressure Pdownstream and then using the relationship Pupstream = ΔP + Pdownstream, there is obtained entirely sufficient precision for Pupstream.

By virtue of this model, it is possible to save on the upstream sensor and to manufacture, at lower cost, a device for use of the method for regeneration of the particulate filter.

Of course, the present invention is not limited to the embodiment described and illustrated, which embodiment is presented by way of an illustrative and non-limitative example.